

REMARKS

The Applicants request reconsideration of the rejection.

Claims 1, 4, and 6-10 remain pending.

Claims 1, 4 and 6-9 were rejected under 35 U.S.C. §103(a) as being anticipated by Rosenschein et al., US 6,113,558 (Rosenschein) in view of Ueberle, US 4,819,621 (Ueberle). The Applicants traverse as follows.

In accordance with the present invention as now claimed, the ultrasonic transducer irradiates a region to be treated with therapeutic ultrasound of 1 to 10 MHz so as to thermally coagulate diseased tissues. A sound wave in the audible band is then detected, which indicates the presence of bubbles of vapor or the like, which are rapidly produced as a result of the rapid heating of the tissues. That is, the sound is generated by the bubbles against the tissues (i.e., not the sound reflected by the bubbles themselves). In this way, heat coagulation can be ensured during thermocoagulation treatment, which is a unique effect of the invention as claimed. Thus, audible sound is detected from the diseased region so as to ensure the heating effect of the apparatus, by which the diseased region is heated with a strong ultrasound wave.

In contrast, Rosenschein teaches a therapeutic apparatus for irradiating a blood clot with ultrasound so as to promote

destruction or lysis by cavitation, which is detected in order to secure the effectiveness of the destruction of the clot. In Ueberle, who teaches an ultrasound therapeutic apparatus for treating concretions by destruction, the purpose is to detect undesired damage caused by cavitation or heat that could be generated as a side effect. Thus, both Rosenschein and Ueberle differ from the present application, whose purpose is to secure the effect of thermal therapy, in terms of objective, structure and function. More importantly, these differences represent patentable novel and nonobvious improvements which are not taught or suggested by the individual teachings of Rosenschein and Ueberle, or by their combined teachings.

Due to the difference between the present application and the applied references, the configuration of the apparatus differs in the frequency band in which the strong ultrasound transducer is operated. Specifically, in accordance with the present invention, a strong ultrasound wave of several megahertz (1 to 10 MHz as described in the specification and as now claimed) is irradiated, which is most suitable for the thermal coagulation of the diseased tissues.

In contrast, the frequency band used in Rosenschein for destroying and lysing blood clots is 750 KHz (col. 5, line 60)

in one disclosed embodiment, and is described elsewhere from 100 to 1000 KHz (col. 5, line 28) or 20 to 100 KHz (col. 5, line 30). Thus, the frequency band used by Rosenschein is up to 1000 KHz (1 MHz). As opposed to the apparatus of the invention which is used for heating purposes, the apparatus of Rosenschein is a therapeutic ultrasound device employing low frequencies that are advantageous in giving physical vibrations to blood clots so as to facilitate the physical destruction of the blood clots (that is, the effect of a thrombolytic agent). Such a low frequency band is advantageous for physical vibrations but not for heat generating purposes, due to the fact that ultrasound absorption in tissues is weak in such a band.

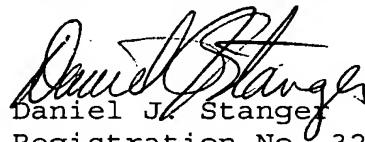
Similarly, the purpose of Ueberle is physical destruction of concretions, and therefore its operation and the frequency band used are different from those of the present invention. Although the frequency band of the present invention is advantageous for heating purposes, it is not suitable for physical vibrations for destroying concretions, for example. Therefore, the present invention would not be applicable to concretion-destroying apparatuses.

Due to the structural differences of the invention, namely the difference in the frequency band used for

ultrasound irradiation, the apparatus of the present invention can uniquely realize quick heating of tissues, as mentioned above. This makes it possible for the invention to detect the sound of bubbles of vapor or the like, which are rapidly produced as a result of the rapid heating of the tissues, as the bubbles press against the tissues (i.e., not the sound reflected by the bubbles themselves, but the sound produced by a phenomenon substantially different from cavitation produced by a transmitted ultrasound wave). By thus detecting the "audible sound", the point in time at which the diseased portion has reached a sufficiently heated state can be ascertained, so that heat coagulation can be ensured in a heat coagulation therapy, which is a unique effect of the invention.

In view of the foregoing remarks and amendments, the Applicants request reconsideration of the rejection and allowance of the claims.

Respectfully submitted,


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